

Simplifying Rational Expressions

Date: _____

A rational expression is a quotient of two polynomials. The polynomial in the denominator must not turn into zero.

Note:

- Always factor first
- Reduce where possible
- Check restrictions as soon as you factor (Restrictions always apply to original question.)

Ex. Simplify and state restrictions on the variable.

a) $\frac{x}{2x^2 - 4x}$

b) $\frac{3 - 2x}{4x - 6}$

c) $\frac{x^2 + 3x - 10}{x^2 + 8x + 15}$

d) $\frac{2y^2 - y - 15}{4y^2 - 13y + 3}$

Adding & Subtracting Rational Expressions (Notes) - Day1

As with adding and subtracting rational numbers, the important step in adding and subtracting rational expressions is finding a lowest common denominator. In some cases this is an easy step as the product of the two denominators is a suitable choice, but as with rational numbers, this is not always the lowest common denominator.

Example 1:

In each question, complete the missing numerator.

$$\text{a) } \frac{3}{4x} = \frac{\quad}{12xy}$$

$$\text{b) } \frac{7}{x-4} = \frac{\quad}{3(x-4)}$$

$$\text{c) } \frac{5}{3-x} = \frac{\quad}{x-3}$$

$$\text{d) } \frac{2y}{x+4} = \frac{\quad}{(x+4)(x-2)}$$

$$\text{e) } \frac{5}{3} = \frac{\quad}{3x(x-2)}$$

Example 2:

Simplify and state the restrictions if possible.

$$\text{a) } \frac{2x}{3} + \frac{5x}{7}$$

$$\text{b) } \frac{3}{2x} + \frac{7}{5x}$$

$$\text{c) } \frac{2x-3}{4} + \frac{6x-1}{3}$$

$$\text{d) } \frac{4}{3-x} + \frac{3}{x-3}$$

$$\text{e) } \frac{5x-2}{5} - \frac{2x+7}{3}$$

Adding & Subtracting Rational Expressions (Notes) – Day 2

Example 1:

Simplify and state the restrictions if possible.

a) $\frac{4}{5a} - \frac{3}{2a^2} + \frac{1}{a^3}$

b) $\frac{m}{2m-4} - \frac{3}{3m-6} + 1$

c) $\frac{x}{6x+6} + \frac{5}{4x-12}$

d) $\frac{4}{y^2+5y+6} - \frac{5}{y^2-y-12}$

e) $\frac{2x^2+9x+9}{4x^2-9}$

f) $\frac{12x^3-12x^2-45x}{4x^2+16x+15}$

Multiplying & Dividing Rational Expressions

Date: _____

Ex. Simplify and state the restrictions on the variable.

a) $\frac{3a^3}{2b^2} \times \frac{10b^3}{9a^2}$

b) $\frac{x^2+x-6}{x^2+2x-15} \times \frac{x-3}{x-2}$

c) $\frac{2ab}{5c} \div \frac{14a^2b^2}{15c^2}$

d) $\frac{x^2-x-20}{x^2-6x} \div \frac{x^2+9x+20}{x^2-12x+36}$

Ex. Simplify and state the restrictions on the variable.

a) $\frac{4}{5a} - \frac{3}{2a^2} + \frac{1}{a^3}$

b) $\frac{m}{2m-4} - \frac{3}{3m-6} + 1$

c) $\frac{x}{6x+6} + \frac{5}{4x-12}$

d) $\frac{4}{y^2+5y+6} - \frac{5}{y^2-y-12}$

Rational Expressions

Name _____

Additional Exercise

Date _____ Period _____

Simplify each and state the excluded values.

1) $\frac{x^2 - 3x - 40}{5x^3 + 25x^2}$

2) $\frac{20a + 20}{30a + 10}$

3) $\frac{6r - 42}{r^2 - 16r + 63}$

4) $\frac{6n + 48}{4n + 32}$

5) $\frac{x^2 - 17x + 70}{10x^2 + 40x}$

6) $\frac{x^2 - 3x - 28}{x^2 - 10x + 21}$

Simplify each expression.

7) $\frac{1}{x+7} \cdot \frac{3x^2 + 21x}{x+2}$

8) $\frac{1}{x+1} \cdot \frac{x^2 + 3x - 18}{x-3}$

9) $\frac{8n + 40}{2n - 10} \cdot \frac{12n - 60}{12n + 60}$

10) $\frac{45p^2 + 90p}{7p + 9} \cdot \frac{7p^2 + 2p - 9}{5p^2 + 50p + 80}$

11) $\frac{45p^2 - 9p}{35p - 7} \div \frac{9p}{9p^2 + 27p}$

12) $\frac{6r^3 - 24r^2}{10} \div \frac{42r^3 + 48r^2}{70r + 80}$

13) $\frac{3m}{7m - 8} + \frac{2}{6}$

14) $\frac{3x + 7}{5x + 7} - \frac{6}{4x^2}$

15) $\frac{7}{k - 7} + \frac{5}{3k + 4}$

16) $\frac{7}{x + 5} - \frac{6x}{7x - 4}$

17) $\frac{4}{6v} - \frac{5v}{v - 7}$

18) $\frac{5}{4} - \frac{b + 7}{2b + 6}$

19) $\frac{4}{k + 2} - \frac{8k}{10k + 15}$

20) $\frac{7}{3n + 5} + \frac{7}{n - 4}$

21) $\frac{3a}{4a + 12} - \frac{8}{a - 7}$

22) $\frac{6m}{m - 7} + \frac{2m}{3m - 7}$

Answers to Additional Exercise (ID: 1)

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|--|--|--|-------------------------------------|
| 1) $\frac{x-8}{5x^2}; \{0, -5\}$ | 2) $\frac{2(a+1)}{3a+1}; \{-\frac{1}{3}\}$ | 3) $\frac{6}{r-9}; \{7, 9\}$ | 4) $\frac{3}{2}; \{-8\}$ |
| 5) $\frac{(x-7)(x-10)}{10x(x+4)}; \{0, -4\}$ | 6) $\frac{x+4}{x-3}; \{3, 7\}$ | 7) $\frac{3x}{x+2}$ | |
| 8) $\frac{x+6}{x+1}$ | 9) 4 | 10) $\frac{9p(p-1)}{p+8}$ | 11) $\frac{9p(p+3)}{7}$ |
| 12) $r-4$ | 13) $\frac{16m-8}{3(7m-8)}$ | 14) $\frac{6x^3+14x^2-15x-21}{2x^2(5x+7)}$ | |
| 15) $\frac{26k-7}{(3k+4)(k-7)}$ | 16) $\frac{19x-28-6x^2}{(7x-4)(x+5)}$ | 17) $\frac{2v-14-15v^2}{3v(v-7)}$ | 18) $\frac{3b+1}{4(b+3)}$ |
| 19) $\frac{24k+60-8k^2}{5(2k+3)(k+2)}$ | 20) $\frac{28n+7}{(3n+5)(n-4)}$ | 21) $\frac{3a^2-53a-96}{4(a+3)(a-7)}$ | 22) $\frac{20m^2-56m}{(3m-7)(m-7)}$ |